

CLAIMS

Having described the invention, what is claimed as new and desired to be secured by Letters Patent is:

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1. A system for determining the presence or absence of an ion in a plasma, comprising:
an ion source having a plasma chamber sized and dimensioned for generating a plasma having an ion present therein, and
a probe assembly coupled to the ion source for detecting said ions of said plasma.

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2. The system of claim 1, wherein said probe assembly comprises a probe device extending within the plasma chamber for extracting said ion from said plasma.

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3. The system of claim 2, wherein the probe device comprises:
a probe body having a conical tip disposed within the plasma chamber, and
a focusing element mounted to said probe body and adapted for generating a field, when energized, therein.

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4. The system of claim 1, wherein the probe assembly comprises:
a probe device for extracting one or more of said ions from said plasma, and
a filter coupled to said probe device for filtering said one ore more ions extracted by said probe device from said plasma.

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5. The system of claim 4, wherein the filter comprises at least one of a Wien filter and an EXB filter.

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6. The system of claim 4, wherein the filter comprises a plurality of steel strips for concentrating a magnetic field within the filter.
7. The system of claim 6, wherein the plurality of steel strips are biased at different voltages to produce one of a potential gradient and a uniform electric field within a passageway.

8. The system of claim 4, further comprising means for generating an electric field within the filter to separate one or more ions based on ion velocity.
- 5 9. The system of claim 1, further comprising a vacuum source coupled to said probe device for creating a selected pressure condition therein for facilitating extraction of said ion from said plasma chamber.
- 10 10. The system of claim 1, wherein said probe assembly comprises a probe device having a probe body, a portion of which is adapted to extend into said plasma chamber, and a set of electrodes coupled to said probe body for creating a field therein.
- 15 11. The system of claim 1, wherein said probe assembly comprises a probe device for extracting one or more ions from said plasma, a filter for filtering said ions, and a controller for detecting said one or more ions.
- 20 12. A probe assembly suitable for use with an ion source for detecting an ion in a plasma within a plasma chamber of the ion source, comprising:
a probe body adapted for extending at least partly within the plasma chamber of the ion source;
a focusing element coupled to said probe for generating a selected field within the probe; and
a filter coupled to said probe for filtering said ion passing through said probe and extracted from said plasma chamber.
- 25 13. The probe assembly of claim 12, wherein said probe body comprises a passageway sized and dimensioned for allowing the ion to pass therethrough, said body having a conical end portion that extends within the plasma chamber.
- 30 14. The probe assembly of claim 12, wherein a set of electrodes is coupled to said probe body for creating a field therein.

15. The probe assembly of claim 14, wherein said electrodes comprise a quadrupole focusing element for generating a field within the probe body for said ion from said plasma chamber.

5 16. The probe assembly of claim 12, wherein said filter comprises an EXB filter.

17. A method for detecting an ion within a plasma generated within a plasma chamber of an ion source, comprising the steps of:

extracting the ion from the ion source with a probe device; and

10 detecting the ion extracted from the plasma chamber.

18. The method of claim 17, further comprising the step of, prior to the detecting step, filtering one or more ions extracted from the ion source.

15 19. The method of claim 17, wherein the step of filter comprises the step varying a field so as to filter the one or more ions based on ion velocity.

20. The method of claim 17, further comprising the step of twisting a set of electrodes to produce a rotating quadrupole field that alternately focuses ions in all directions.

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